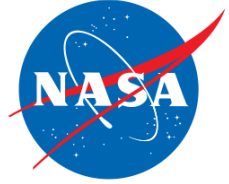


NASA Turbulent Flow Duct (TFD)

Mission: The Turbulent Flow Duct is designed to produce high enthalpy supersonic turbulent flow over the surface of a wall-mounted panel in the constant-area section of a duct.



View of the TFD facility.

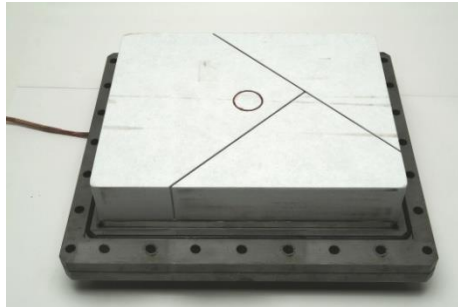
Location: NASA Ames Research Center, Moffett Field CA 94035-1000, USA

Type of tunnel: Huels arc heater facility.

Test gas	Air, N ₂	Test duration (min)	≤ 30
Nozzle exit (mm)	51x229	Test article type	Flat plate
Input power (MW)	12	Test article size (mm)	203x254 or 203x508
Bulk enthalpy (MJ/kg)	3.5-10.5	Surface pressure (kPa)	2-15.2
Shear Stress (Pa) - estimate	40 - 290	Heating rate (kW/m ²)	23-681

Instrumentation:

- Hot wall temperature: thermocouples, IR thermography and radiometry
- Pressure: static
- Cold wall heat flux: copper Gardon gauges



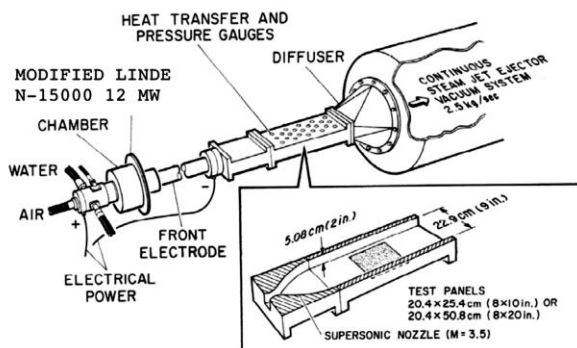
Turbulent flow duct test model prior to (left) and after testing (right).

References:

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Covington, M.A.; and Vojvodich, N.S.: "Turbulent Flow Studies in Two Arc-Heated Duct Facilities." J. Spacecraft and Rockets, vol. 9, no. 6, June 1972, pp. 441-447.

Alunni, A.L.; Olson, M.W.; Gökçen, T.; and Skokova, K.A., "Comparisons of Surface Roughness in Laminar and Turbulent Environments for Orion Thermal Protection System." In 42nd AIAA Thermophysics Conference, AIAA 2011-3776, June 2011, Honolulu, HI



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